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Stenosis, Physiology and Medications are not enough: Vulnerable Plaque Must be identified

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Disclosure

FINANCIAL DISCLOSURE:

Grants/Research Support: LightLab Imaging/St. Jude Medical, Medtronic

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What to treat/prevent?

Angiographic stenosis → Interventionalists

Angina on exertion → Improves quality of life

AMI or SCD → Enormous benefit

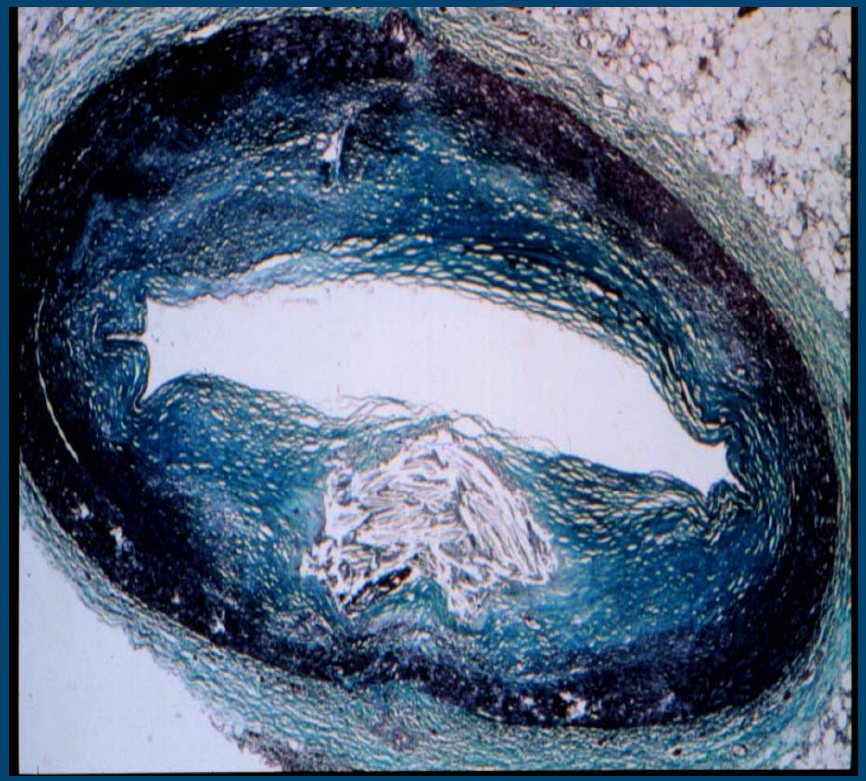
Potentially

SCD in USA

- 1000/day
- 1/1000 person year
- Men x3 > women
- 75% at home
- Etiology: 75% CAD ← Vulnerable Plaque

Can VP be identified ?

Vulnerable Plaque



- Large lipid
- Thin fibrous cap
- High MΦ density
- Positive remodeling
- Inc vasa vasorum

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Intravascular Diagnostics for VP

Modality	Resolution	Penetration	Cap	Lipid	Inflam	Ca
IVUS	100 µm	good	+	+	-	+++
Angioscopy	100 µm	poor	+	++	-	-
OCT	**10 µm**	**poor**	**+++**	**+++**	**++**	**+++**
Thermography	-	poor	-	-	++	-
Spectroscopy	-	poor	+	+++	++	++
IV MR	160 µm	good	+	++	+	++

Suh, Jang. Circ Img 2011

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OCT: Ex Vivo Study Results

Fibrous	SENS	**.87**	PPV	**.88**
	SPEC	**.97**	NPV	**.96**
Calcific	SENS	**.95**	PPV	**1.0**
	SPEC	**1.0**	NPV	**.95**
Lipid	SENS	**.92**	PPV	**.81**
	SPEC	**.94**	NPV	**.97**

Interobserver k **= 0.88,** Intraobserver k **= 0.91**

Yabushita, .. Jang, Bouma, Tearney. Circulation 2002

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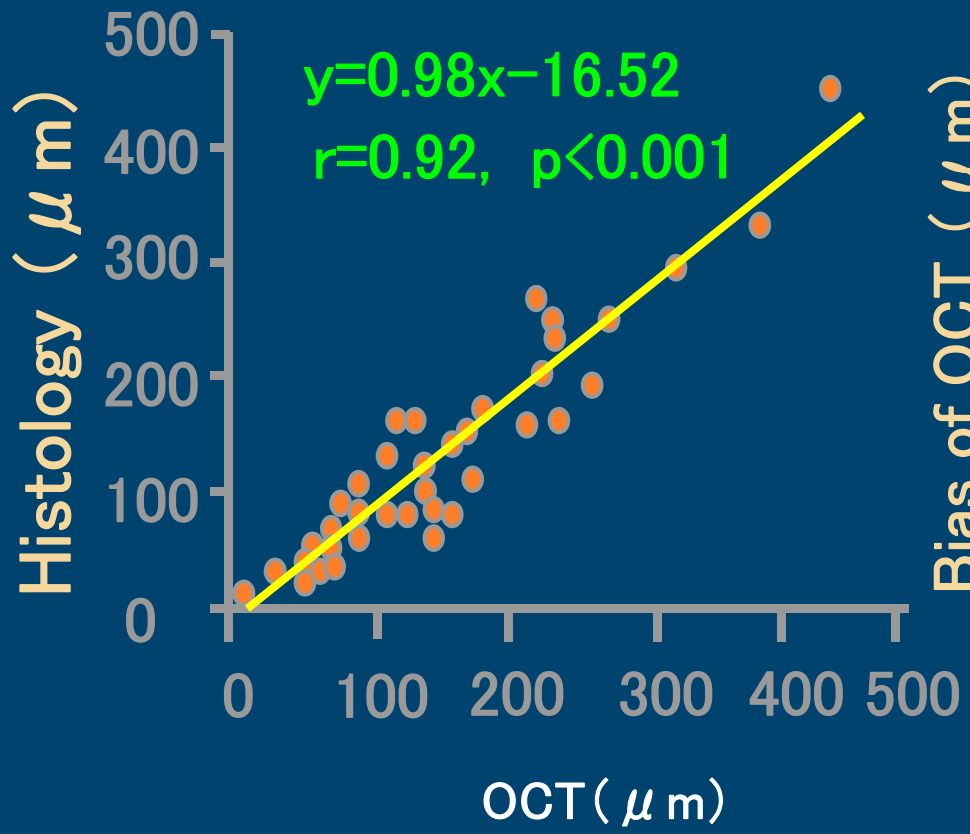
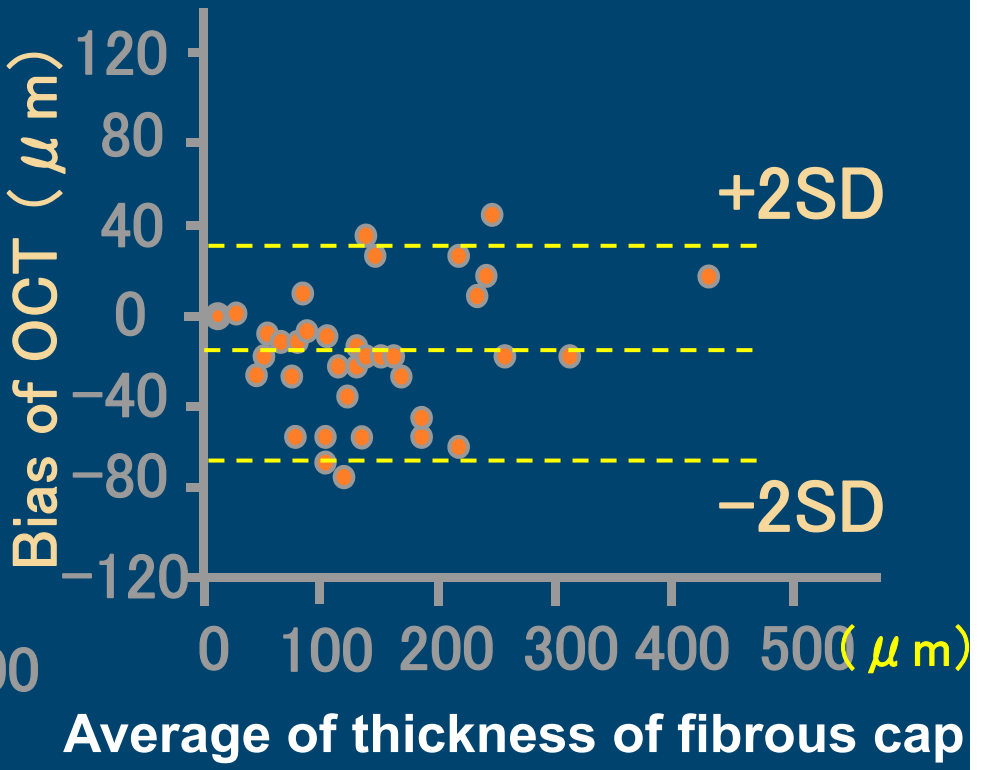
Fibrous Cap Thickness Histology vs OCT





Average of thickness of fibrous cap

Kume, Akasaka. Am Heart J . 152:755, 2006

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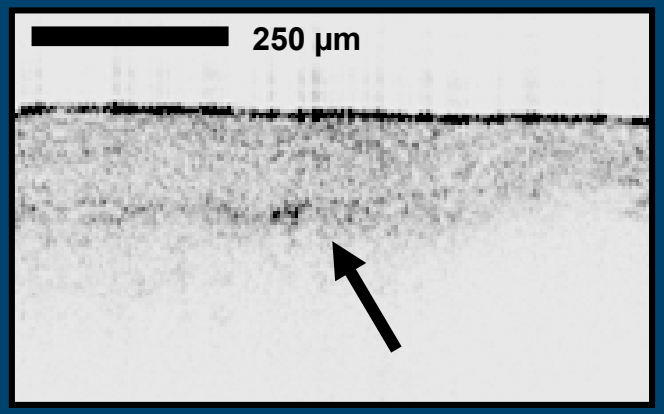
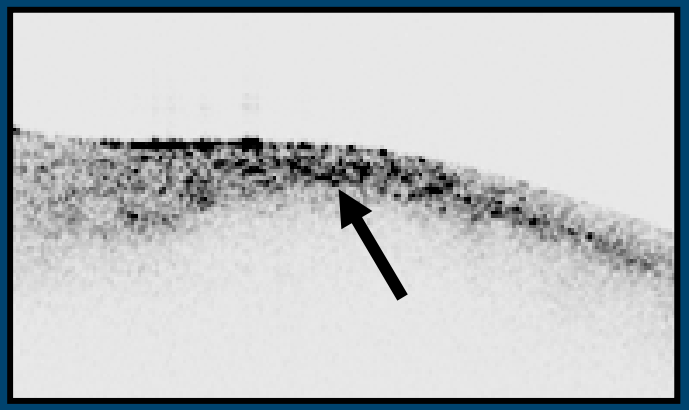
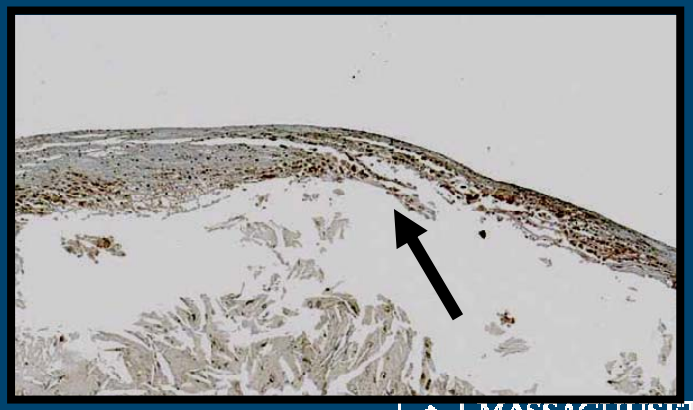
Macrophage Study

	Low Mϕ	High Mϕ
OCT		
CD68		

AMI v ACS v SAP

	AMI (n=20/30/35)	ACS (n=20/24/--)	SAP (n=17/31/20)
LRP (%)	90/93/--	75/71/--	58/42/--
FCT (μm)	47/49/--	54/79/--	103/196/--
TCFA (%)	72/83/77	50/46/--	20/3/25
MΦ (%)	5.7±1.4	5.9±2.1	4.2±1.7

Jang 2005/Kubo 2007/Fujii 2008

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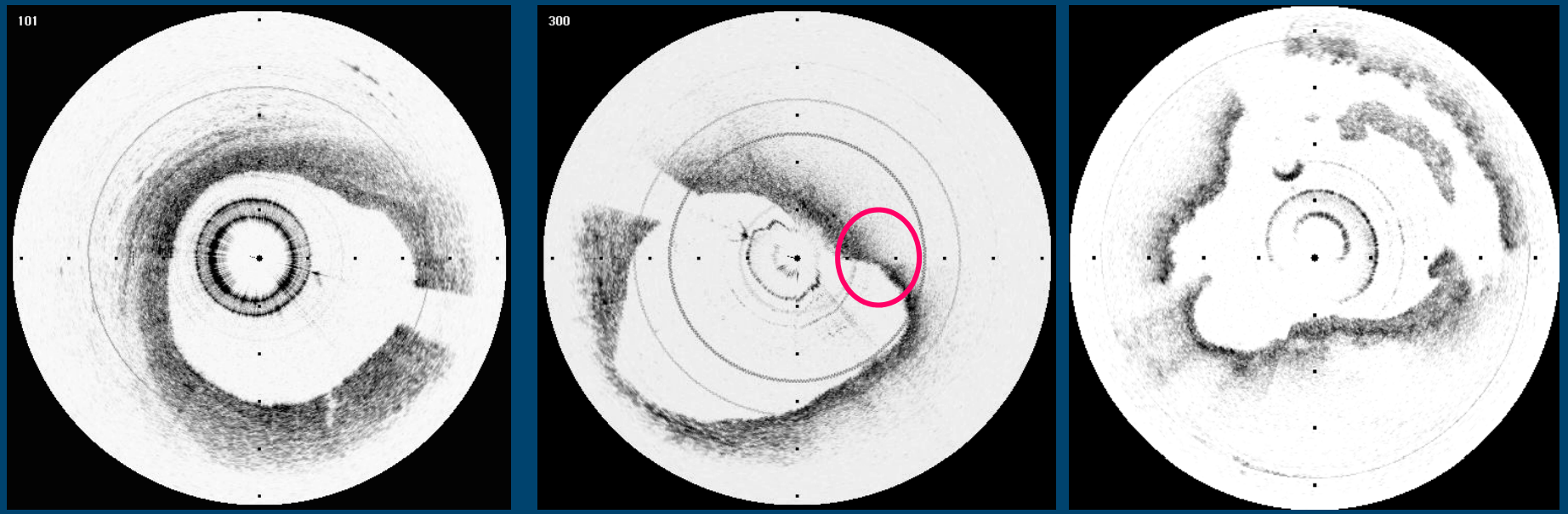
TCFA (Thin Cap FibroAtheroma)



Stable Plaque TCFA Ruptured Plaque

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Must VP be identified?

The PROSPECT Trial (700 ACS pts)

3-vessel imaging post PCI: Culprit artery, followed by non-culprit arteries

Angiography (QCA of entire coronary tree)

IVUS

Virtual histology

Palpography (n=~350)

Proximal 6-8 cm of each coronary artery

Meds rec
Aspirin
Plavix 1yr
Statin
Repeat biomarkers
@ 30 days, 6 months

F/U: 1 mo, 6 mo, 1 yr, 2 yr, ±3-5 yrs

MSCT Substudy N=50-100

Repeat imaging in pts with events

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PROSPECT: MACE
3-year follow-up, hierarchical

	All	Culprit lesion related	Non culprit lesion related	Indeter-minate
Cardiac death	1.9% (12)	0.2% (1)	0% (0)	1.7% (11)
Cardiac arrest	0.3% (2)	0.3% (2)	0% (0)	0% (0)
MI (STEMI or NSTEMI)	2.7% (17)	1.7% (11)	1.0% (6)	0.2% (1)
Rehospitalization for unstable or progressive angina	15.4% (101)	10.4% (69)	10.7% (68)	0.8% (5)
Composite MACE	20.4% (132)	12.9% (83)	11.6% (74)	2.7% (17)
Cardiac death, arrest or MI	4.9% (31)	2.2% (14)	1.0% (6)	1.9% (12)

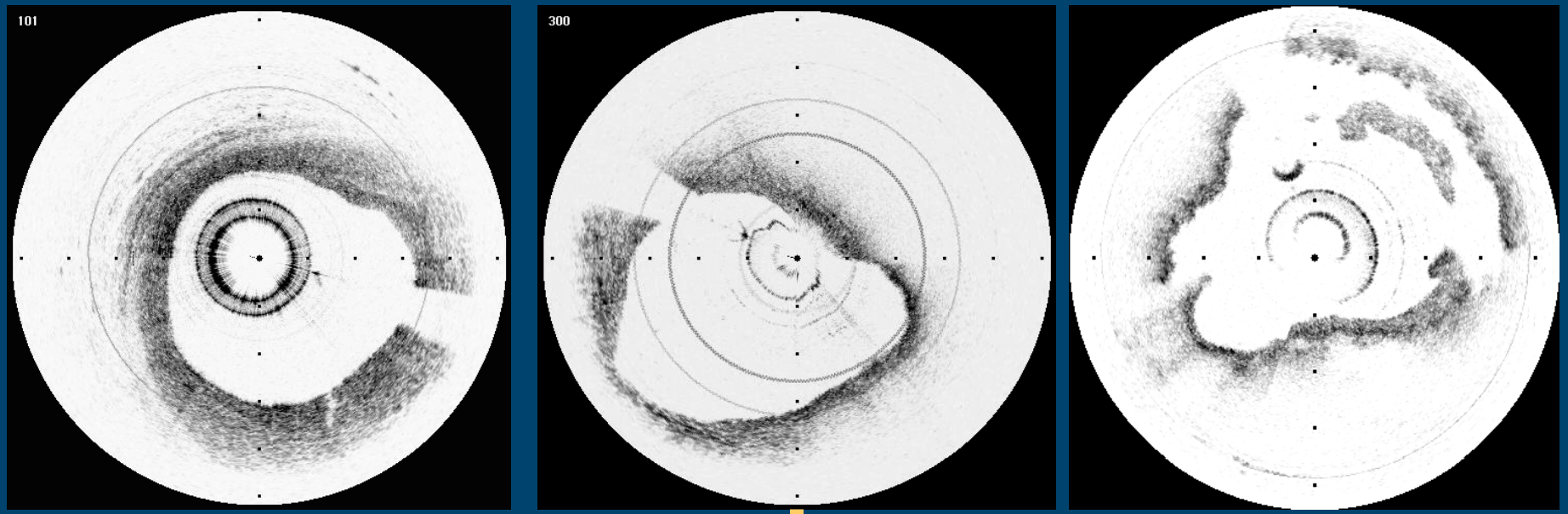
Rates are 3-yr Kaplan-Meier estimates (n of events)

PROSPECT: Implications

- The relatively low prevalence of high-risk lesions (~1 in 5 pts), coupled with the fact that when they become symptomatic they usually present with angina and not death or MI, suggests that **3-vessel imaging to identify and prophylactically stent these lesions is not warranted** in ACS patients who are revascularized and treated with optimal medical therapy.

- Similarly, if a high risk non ischemia-producing lesion happens to be found (e.g. 3 year event rate >10%), since most patients present with angina, **prophylactic DES cannot be recommended.**

TCFA



Stable Plaque — TCFA — Ruptured Plaque

Study Date
April 2000

5 years later
No MACE

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Frequency of AMI

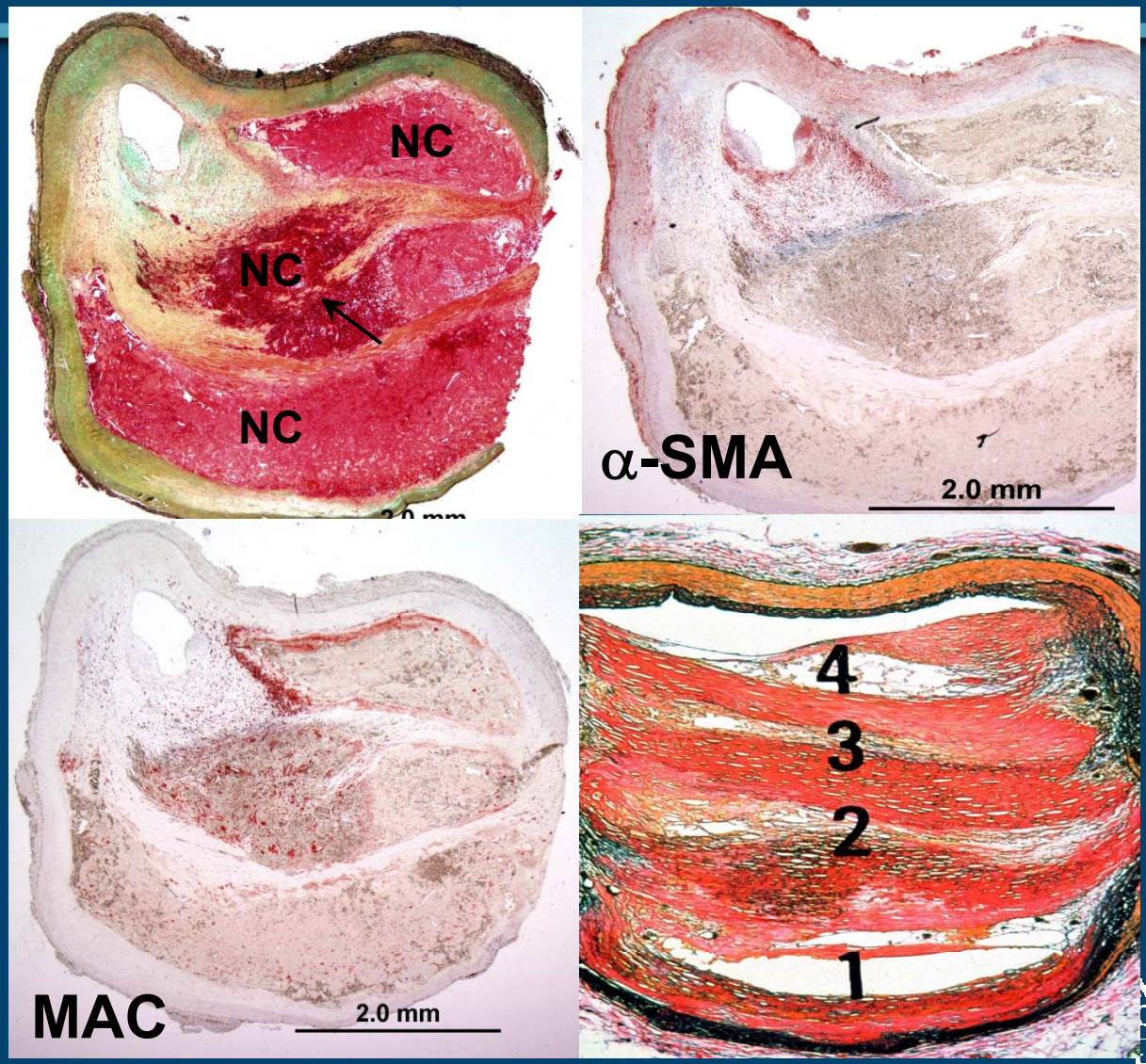
- 59 cases with acute thrombus

41 Rupture → 4 AMI (19%)

18 Erosion → 2 AMI (11%)

Majority of plaque disruptions are silent!

Burke A. NEJM 1997



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Courtesy to Dr M Sangiorgi

Summary

- Can TCFA be identified? Yes
- Must VP be identified? ??

However…..
one study
one modality

MGH OCT Registry

- Target #: 3000 - 5000 patients

- Follow up: 5 years

- Start: June 1, 2010

- Sites: 20

http://www.massgeneral.org/octregistry

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Participating PIs and Institutions

Australia
- OC Raffel: Brisbane
- H Lowe: Sydnesy
- P Balis: Melburn

China
- B Yu: Harbin Med Univ.
- S Lee: Univ. of Hong Kong

USA
- IK Jang: MGH
- A Prasad: Mayo
- S Sharma: Mt. Sinai

Japan
- K Mizuno: Tokyo
- S Uemura: Nara Univ.
- K Kakuta: Tsuchiura Kyodo
- T Ito: Iwate

Korea
- SY Choi: Ajou
- YS Jang: Yonsei
- SJ Kim: Kyung Hee
- JM Cho: EW
- SJ Park: Asan

Singapore
- S Chia: National Heart Center

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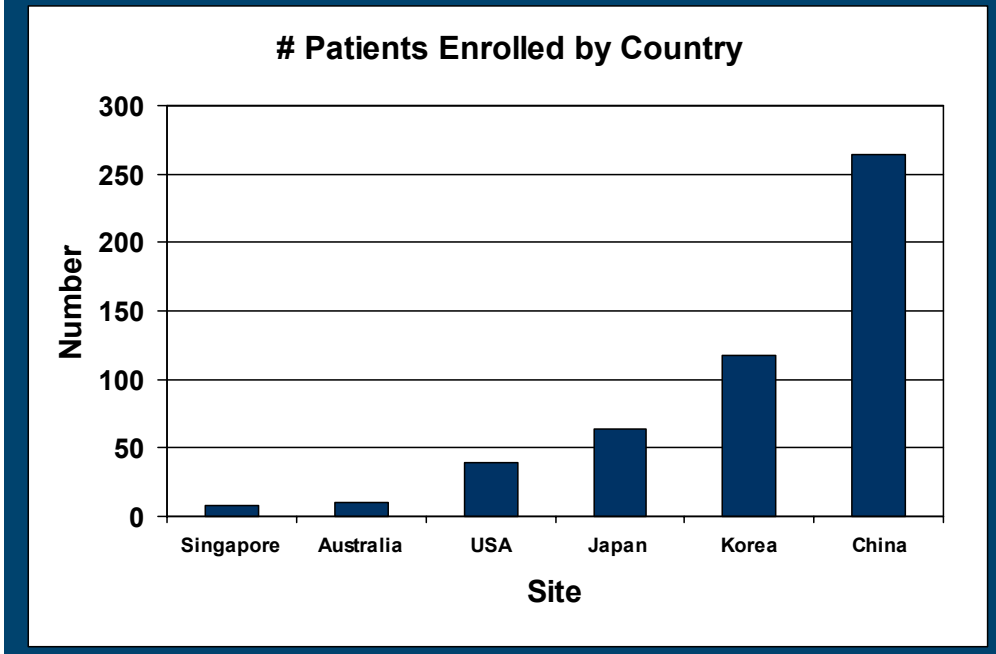
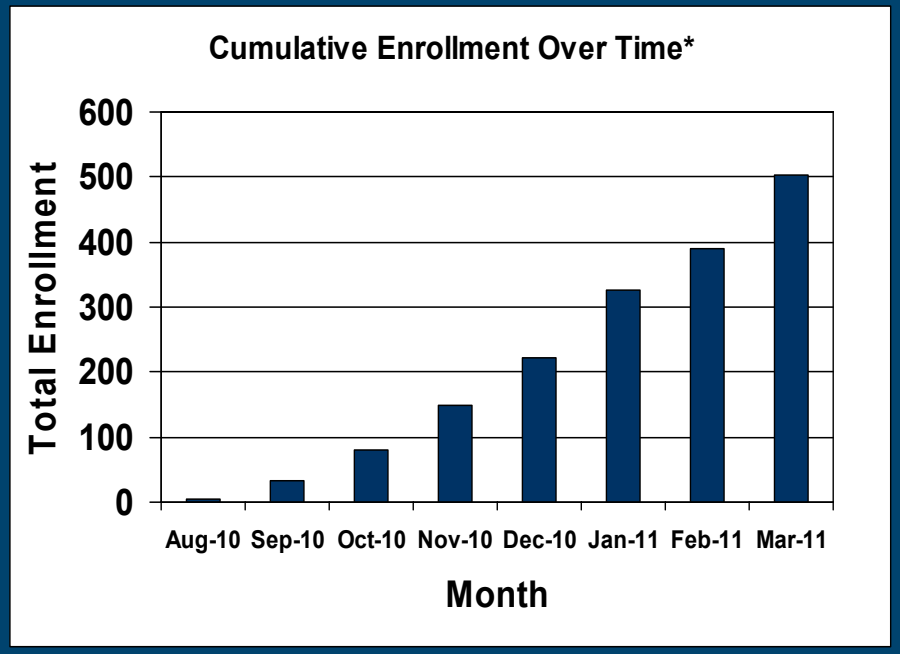
Enrollment Overview

- 503 patients have been enrolled into the Registry from 6 countries





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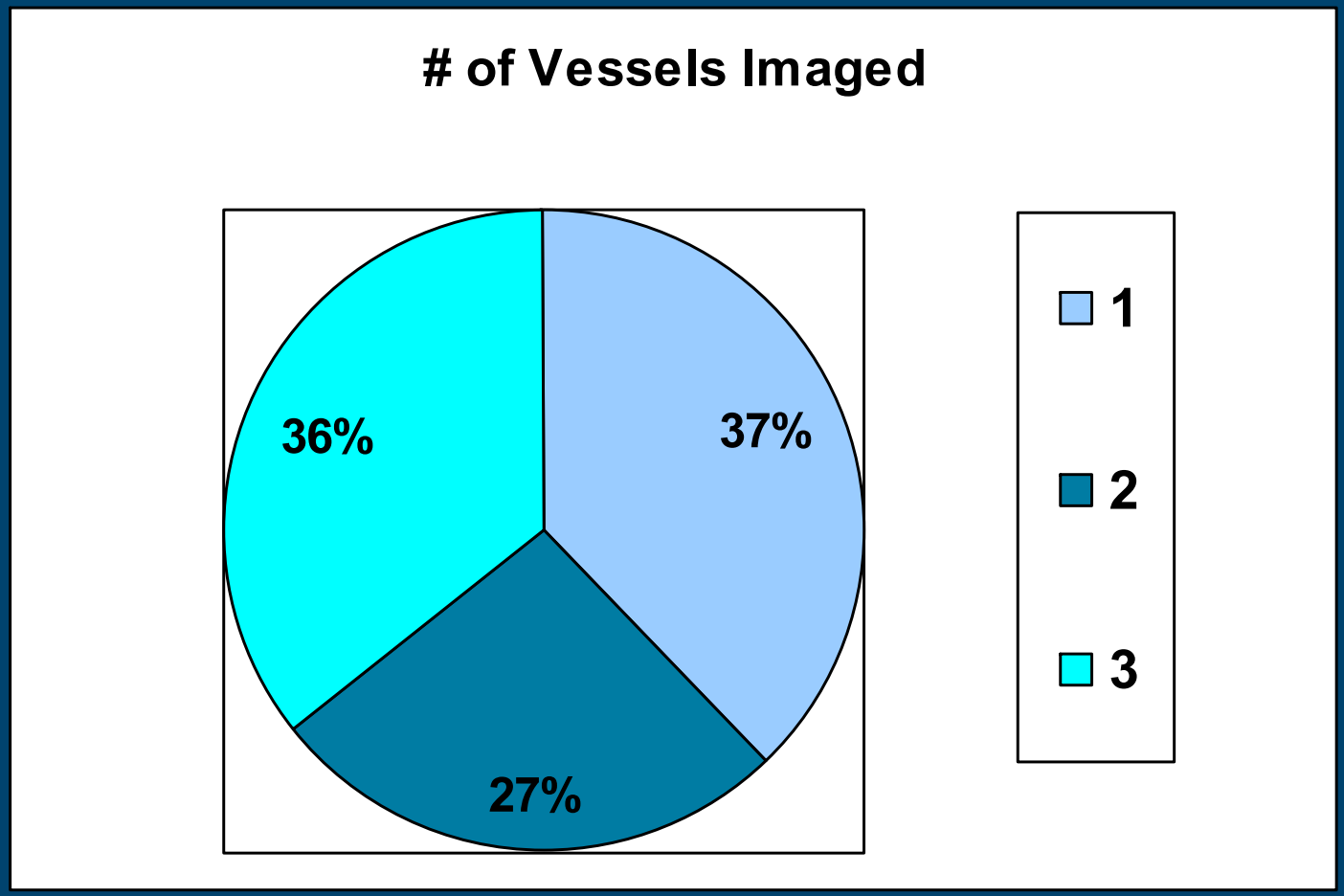
Number of vessels imaged



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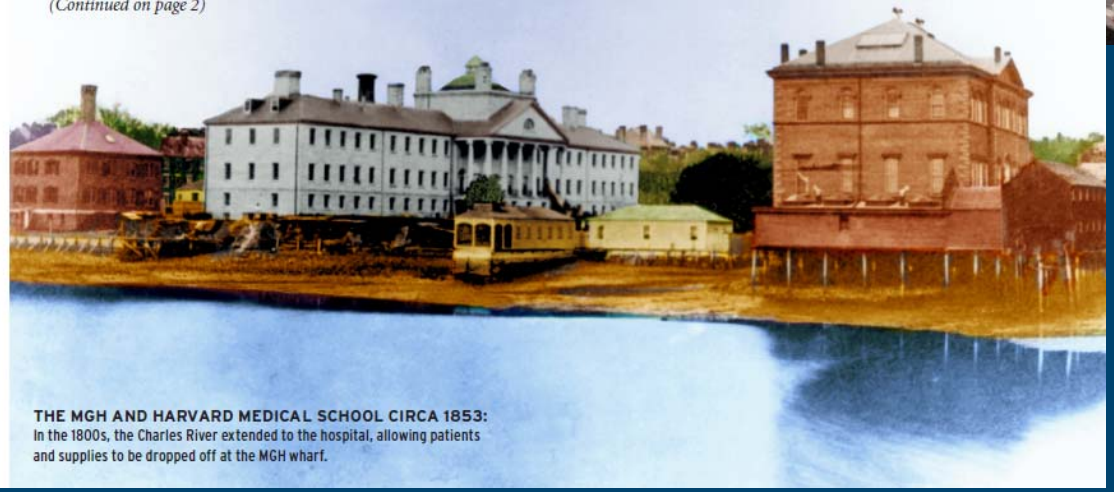
Thank You

MGH history book to commemorate bicentennial

AS PART OF the MGH's bicentennial celebrations, a commemorative book covering the hospital's unique beginnings and illustrious history will be published in 2011. "Something in the Ether, A Bicentennial History of Massachusetts General Hospital, 1811 to 2011," was written by author and publisher Webster Bull. Much of the content was drawn from interviews with longtime MGH staff and countless hours of research of historical records and archival material. The book is scheduled to be released in March and will be available at the MGH General Store and select booksellers.

(Continued on page 2)



THE MGH AND HARVARD MEDICAL SCHOOL CIRCA 1853:
In the 1800s, the Charles River extended to the hospital, allowing patients and supplies to be dropped off at the MGH wharf.

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